

**REMARKS**

Reconsideration of this application is respectfully requested.

Claims 2, 4, 5 and 6 have been amended, and new claims 11-16 have been added.

Upon entry of this amendment, the pending claims will be claims 1-16.

Minor editorial changes have been made to pages 4 and 6 of the present specification, as well as to claim 4.

On pages 8 and 10, the MPa equivalent ( $10^{-1}$  MPa) of 1 Atm has been inserted in parentheses.

A mathematical error has been corrected on page 10 of the specification.  $3.8 - 0.02 = 3.78$ , not "3.75".

On pages 9 and 10 of the present specification, the oxygen partial pressure and water-vapor partial pressure of the air used in Comparative Example 1 and Inventive Example 3 has been specified. Applicant was required to include this insertion in the Japanese counterpart of the present application. The insertions to pages 9 and 10 correspond to the standard value of "in air" in Japan.

Support for the amendment to claim 2 may be found in the present specification at page 8, lines 11-13.

Support for the amendments to claims 5 and 6 may be found in the present specification at page 9, lines 14-19.

Support for newly added claims 11-15 may be found in the present specification at

page 7, lines 3-13, and in Table 1 on page 11.

Support for newly added claim 16 may be found in the present specification at page 3, line 20 to page 4, line 8.

For the reasons given on page 2 of the Official Action, claims 5 and 6 are rejected under 35 USC 112, second paragraph. The Examiner states that the recitation of "analyzed" does not distinctly claim what the step of the process is.

This rejection has been obviated by the foregoing amendments, whereby "analyzed" has been changed to --measured--.

Accordingly, the rejection under 35 USC 112 should be withdrawn.

For the reasons 2 and 3 of the Official Action, claims 1 and 7-10 are rejected under 35 USC 103(a) over the disclosure of the Hosono et al article or the disclosure of the Imlach et al article or the disclosure of the Strober et al article.

This rejection is respectfully traversed.

None of the three articles applied against the claims expressly recite features of the present claims. However, since the Examiner interprets these articles as describing materials made from substantially the same starting materials in substantially the same way, the Examiner takes the position that materials claimed in the present claims 1 and 7-10 are inherently described or suggested by these articles.

None of the three articles anticipate the present claims under the doctrine of inherent anticipation.

The Hosono article does not inherently suggest the compound recited in the present claims 1 and 7-10.

In the first column on page 1193 of the Hosono article, in the "Experimental Section" it is first stated:

Polycrystalline  $12\text{CaO} \cdot 7\text{Al}_2\text{O}_3$  was prepared by two methods, a solid-state reaction between  $\text{CaCO}_3$  and  $\text{Al}(\text{OH})_3$  or  $\text{Al}_2\text{O}_3$  and a slow cooling method using a melt with the composition  $\text{CaO}/\text{Al}_2\text{O}_3 = 12/7$ .

Later in this section it is stated:

All the procedures stated above were, unless otherwise noted, made in the ambient atmosphere.

Nowhere in the Hosono article would there appear to be suggested a procedure for preparing a polycrystalline material in an atmosphere containing more oxygen and less moisture than an ambient atmosphere. To the contrary, crystallization in vacuo is described near the bottom of column 2 of page 1194 of the Hosono article.

As pointed out in the present specification, an ambient atmosphere is insufficient to prepare the presently claimed compounds. In particular, in Table 1 on page 11 of the present specification, it is pointed out that the concentration increases of  $\text{O}_2^-$  radical increases from  $1 \times 10^{19}$  to  $1 \times 10^{21} \text{ (cm}^{-3}\text{)}$  (a 100 fold increase), when air is replaced by an atmosphere of oxygen, as demonstrated by results given for Comparative Example 1 and Inventive Example 1, respectively. Table 1 further indicates that this increase, in terms of  $\text{O}_2^-$  radicals per unit cell, goes from 0.02 radicals per unit cell for Comparative Example 1 to 1.9 radicals

per unit cell for Inventive Example 1.

On page 2 of the Official Action, it is stated:

Hosono specifically teaches an oxygen concentration of  $4 \times 10^{18}$  units/g which appears to be the same as the instantly claimed  $10^{20} \text{ cm}^{-3}$ .

However,  $4 \times 10^{18}$  units/g is much smaller than the instantly claimed  $10^{20} \text{ cm}^{-3}$ .

The measure "units/g" means "numbers of ions/g" and is the same as "spins/g" in the Strober et al article (because one ion has one spin). The density of  $12\text{CaO} \cdot 7\text{Al}_2\text{O}_3$  is 2.69. Therefore,  $\text{units/g} = 2.69 \text{ units/cm}^3 (= 2.69 / \text{cm}^3)$ .

Specifically,  $4 \times 10^{18}$  units/g is  $2.69 \times 4 \times 10^{18} / \text{cm}^3 = \text{approximately } 1 \times 10^{19} / \text{cm}^3$ .

The Hosono et al article is authored by an inventor of the present application, and this application is discussed on page 2, lines 12-17, of the present specification, wherein it is stated:

Based on an electron spin resonance analysis, Hosono, one of the inventors, et al. have discovered that about  $1 \times 10^{19} \text{ cm}^{-3}$  of  $\text{O}_2^-$  was clathrated in a  $12\text{CaO} \cdot 7\text{Al}_2\text{O}_3$  crystal synthesized by reacting two raw materials,  $\text{CaCO}_3$  and  $\text{Al}_2\text{O}_3$  or  $\text{CaCO}_3$  and  $\text{Al}(\text{OH})_3$ , in a solid phase reaction at a temperature of  $1200^\circ\text{C}$  in ambient atmosphere. They have proposed a model in which a part of free oxygens exists in each cage structure in the form of  $\text{O}_2^-$  (H. Hosono and Y. Abe, Inorg. Che. 26, 1193, 1987).

Therefore, as suggested on page 2 of the present specification,  $4 \times 10^{18}$  units/g corresponds to no more than  $10^{19} \text{ cm}^{-3}$ , which is ten times less than the presently claimed concentration of  $10^{20} \text{ cm}^{-3}$ .

In the Official Action, no particular statements are made about the Strober article or

the Imlach article. However, neither of these articles would appear to suggest the presently claimed embodiments.

It would appear that the compositions prepared in the Stober article were prepared in an ambient atmosphere.

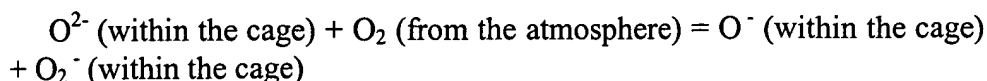
In the sentence bridging columns 1 and 2 on page 162 of the Strober article, it is stated:

The concentration of  $O_2^-$  is of about  $10^{19}$  spins/g and can unambiguously be increased by a temperature treatment ( $900^\circ C$ ) within an oxygen atmosphere or decreased in a nitrogen atmosphere.

This statement suggests some measurable increase upon heat treatment, but not necessarily the ten fold increase necessary to achieve the presently claimed concentration of  $10^{20} \text{ cm}^{-3}$ .

The present specification suggests that a temperature of at least  $1200^\circ C$  is needed to achieve a very high  $O_2^-$  radical concentration. In particular, the following is stated at page 7, lines 3-20:

The  $O^{2-}$  ion clathrated by the cage is confined within the cage so as to prevent any reaction with the outside atmosphere. However, in a high temperature of  $1200^\circ C$  or more, the size of the cage is thermally expanded. This allows oxygen molecules from the atmosphere to pass through the bottleneck of the cage. Consequently, the following reaction will be caused.



Thus, a pair of  $O^-$  and  $O_2^-$  is generated from an oxygen ion  $O^{2-}$  residing in each of the unit cell as a result of the reaction with  $O_2$  molecule. The

$12\text{CaO} \cdot 7\text{Al}_2\text{O}_3$  compound clathrating  $\text{O}^-$  and  $\text{O}_2^-$  in a high concentration can be represented by  $[\text{Ca}_{24}\text{Al}_{28}\text{O}_{64}]^{4+} \cdot m \text{O}_2^- \cdot m \text{O}^- \cdot (2 - m) \text{O}^{2-}$ , where  $m \leq 2$ , and the  $\text{O}_2^-$  and  $\text{O}^{2-}$  are clathrated within the cage.

By subjecting the compound to a heat treatment at a temperature of  $1200^\circ\text{C}$  or more under an atmosphere with an oxygen partial pressure of  $10^4$  Pa or less or a water-vapor partial pressure of  $10^2$  Pa or more, oxygen molecules from the atmosphere actively pass through the bottleneck of the cage. Thus, during the course of the transition of the concentration of the active oxygen ion radicals to a certain equilibrium concentration, the active oxygen ion radicals can be released from the cage to the atmosphere.

Accordingly, the  $900^\circ\text{C}$  temperature, recited on page 162 of the Strober article may be too low to permit the formation of a composition having the very high  $\text{O}_2^-$  concentration of the present claims.

Applicants have informed the undersigned that it is possible that the heat treatment described in the Strober article could result in an  $\text{O}^{2-}$  concentration of  $10^{20} \text{ cm}^{-3}$ . However, a rejection based upon inherency cannot be based on a mere possibility.

The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic. In re Rijckaert, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993) (reversed rejection because inherency was based on what would result due to optimization of conditions, not what was necessarily present in the prior art); In re Oelrich, 666 F.2d 578, 581-82, 212 USPQ 323, 326 (CCPA 1981). "To establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.'" In re Robertson, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999) (citations omitted) (The claims were drawn to a disposable diaper having three fastening elements. The reference disclosed two fastening elements that could perform the same function as the three fastening elements in the claims.

The court construed the claims to require three separate elements and held that the reference did not disclose a separate third fastening element, either expressly or inherently.).

MPEP 2112.

The embodiments of newly added claim 16 are particularly distinguished from the disclosure of the Strober article.

The Imlach article also would not appear to describe a composition, which would inherently have the very high  $O_2^-$  concentration recited in the present claims. The samples reported in Table 1 on page 59 of the Imlach article were prepared by melting and freezing batch compositions in air. On page 60 of the Imlach article, it is indicated that the oxygen content did not amount to even one peroxide ion or similar entity per unit cell.

Thus, it is not apparent that the disclosure of the Imlach article inherently suggest the presently claimed composition having a very high  $O_2^-$  concentration.

New claims 11-15, calling for the presence of  $O^-$  ions, are particularly novel and non-obvious. In this regard, note that Table 1 on page 1193 of the Hosono article suggests that  $O^-$  ions are absent from the crystalline  $12CaO \cdot 7Al_2O_3$  species, described therein.

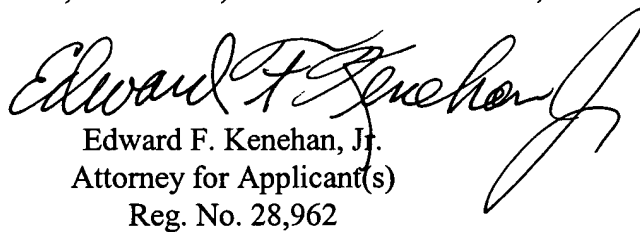
Accordingly, the rejections under 35 USC 103 should be withdrawn.

Allowance is requested.

In the event that this paper is not timely filed, Applicant respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,

WESTERMAN, HATTORI, DANIELS & ADRIAN, LLP

  
Edward F. Kenehan, Jr.  
Attorney for Applicant(s)  
Reg. No. 28,962

EFK/jli

1250 Connecticut Avenue, N.W. Suite 700  
Washington, D. C. 20036  
202-822-1100 (t)  
202-822-1111 (f)